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RESEARCH NOTES:

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DYED DIESEL EDUCATION AND ENFORCEMENT

Background

Federal and state laws and regulations allow diesel used for farm, construction, educational, or off-road use to be purchased tax-free. This tax-free diesel must be dyed red to identify it for non-taxable use and fuel suppliers must report their acquisitions and distributions of dyed diesel on a monthly basis. Because the retail price of diesel includes a federal tax of 24.4 cents per gallon, and a state tax of either 26 cents or 18 cents per gallon, there is motivation to use dyed diesel for taxable purposes (i.e., on-road use). The on-road use of dyed diesel deprives the federal and state governments of substantial tax revenue. In 1994, the Federal Highway Administration (FHWA) estimated that, nationwide, the combined federal and state fuel tax evasion losses approached \$3 billion annually. Adjusting for inflation using the Consumer Price Index, this loss would be about \$4 billion annually in 2006.

The importance and magnitude of this loss has been the focus of research by scholars and practitioners alike. This focus sharpened in the early 1990s with accounts in trade publications of fuel tax evasion schemes which were related to organized crime. These reports were followed by

linkages drawn between these schemes and the strategies designed to thwart them.

By the mid-1990s, the transportation field began to focus on fuel tax revenue losses and the effects of fuel tax enforcement efforts. Some reports have focused on state and regional topics but, in general, the topic of fuel tax evasion has received little attention since the turn of the century.

Since this same time period, the Internal Revenue Service (IRS) has had a dyed diesel enforcement program, though it has been focused on inspections at fuel terminals and on trucks parked at business locations or job sites. The IRS does not have authority to stop traffic in order to conduct on-road inspections. In August 2002, ADOT initiated federally-funded education and on-road enforcement efforts to decrease the use of dyed diesel for the purpose of tax evasion. Under the program, MVD Enforcement Officers conduct on-road details during which all diesel powered vehicles are required to stop for a fuel inspection.

Both the IRS and ADOT assess penalties and taxes for identified violations, and data relating to such assessments is available. Frequently, tax administration

agencies rely heavily on such tax/penalty assessment data to measure the success of compliance initiatives, even though their ultimate objective is to enhance voluntary compliance with the laws. This is due to the difficulty in measuring the impact of such initiatives on voluntary compliance levels.

This study attempts to identify reliable measures of the compliance impact of ADOT's dyed diesel education and enforcement efforts on the use of dyed diesel for on-highway travel. The field experiment design included the collection of data during "pairs" of enforcement details conducted at locations across the state at intervals of approximately 8 weeks.

Approach

This study attempts to identify reliable measures of the compliance impact of ADOT's dyed diesel education and enforcement efforts, and data collected during the study's field experiment answer the following research questions:

- What are reliable measures of effectiveness for dyed diesel education and enforcement efforts?
- How effective are ADOT dyed diesel education and enforcement efforts?
- What opportunities exist to improve the effectiveness of education and enforcement efforts?
- What strategies should be adopted to improve the effectiveness of education and enforcement efforts?

Data collected during routine dyed diesel inspection details were used to answer the research questions. The inspection details were conducted in rural rather than urban locations to isolate the effect of education and enforcement efforts, and to focus on areas that do not have public

transportation and thus increased use of private vehicles.

The enforcement data were collected during six pairs of enforcement details conducted between late 2004 and mid-2005. Each enforcement detail began in the morning and ended in the afternoon of the same day. The first details lasted for an average duration of 9 hours and 43 minutes, and the second enforcement details lasted for an average duration of 9 hours and 10 minutes. Each pair of enforcement details were separated by an average interval of 58 days.

Findings

The enforcement detail inspections and discovered violations were analyzed to determine the effectiveness of the dyed diesel education and enforcement efforts. The number of inspections and violations were converted to percentages of their respective totals to facilitate direct comparisons. The number of violations was also converted to rates per 100 inspections to control for the varying number of inspections of each vehicle type.

Between Detail 1 and Detail 2, the violation rate for pickup trucks decreased by 76%, and there is a 98.7% probability that this reduction is not due to random chance. Rather, this reduction is almost certainly due to the compliance impact of Detail 1.

The study's baseline level of dyed diesel compliance was the level observed during the First Detail (Detail 1), even though that compliance level reflects the impact of pre-study IRS and ADOT educational/enforcement efforts. In other words, it is likely that the baseline First Detail compliance would have been lower if not for pre-study IRS/ADOT education and enforcement activities. The changes in

compliance from the First to the Second Detail reflects the compliance impacts of the First Detail. The amount of lost revenue at the First Detail (Detail 1) compliance level is computed as follows: During Detail 1, a total of 1,109 diesel pickup trucks were inspected and 23 were found to contain dyed diesel. If this *ViolationRate* of 0.020739 is applied to the *AnnualMileage*, the resulting annual lost revenue is estimated to be \$1,466,381.

The amount of lost revenue based upon compliance levels during the Second Detail (Detail 2) can be estimated from the number of inspections and violations in Detail 2. During Detail 2, a total of 1,132 diesel pickup trucks were inspected and 7 were found to contain dyed diesel. As with the preceding calculation, if this *ViolationRate* of 0.006184 is applied to the *AnnualMileage*, the estimated annual lost revenue would be \$437,249.

Thus, the estimated annual increase in tax revenues resulting from the “First Detail” is estimated to be \$1,029,132, in addition to the \$151,412 in average annual collections of taxes and penalties from identified violators. This figure addresses an important point raised in a 1995 ADOT report on fuel tax evasion regarding the lack of a reliable estimate of the return on fuel tax enforcement efforts. This report, produced before ADOT initiated fuel tax education and enforcement activities, noted the complete lack of any reliable estimate of any enforcement measure. This estimate could be affected by a number of factors. The estimate could be too low if there are more violators of the law, if the number of registered diesel powered vehicles is understated, if the annual mileage of diesel pickup trucks is higher than 23,000, or if the fuel efficiency of these vehicles is less than 11 miles per gallon. The estimate could be

too high if the opposite of any of these factors is true.

The interaction of the semi tractor sample size and violation rate change prevented any statistically significant findings from emerging. Thus, an accurate estimate of tax revenue associated with inappropriate fuel use and enforcement efforts for these vehicles cannot be reliably determined.

Recommendations

The results of this study suggest that more than 2% of diesel-powered pickup trucks illegally use dyed diesel on Arizona roadways. Although the study could not statistically quantify violation rates and lost tax revenue for larger trucks, the available data suggest that substantial tax losses do result. Although education and enforcement efforts reduced the rate of pick-up related violations by more than 75%, the financial incentive to evade fuel taxes remains. Continued education and enforcement efforts are required in order to promote voluntary compliance. The data suggest that almost \$1.5 million in diesel tax revenue would be lost each year without enforcement, and the education and enforcement team has demonstrated the ability to reduce dyed diesel violations by more than 75%. Given that the current Tax Evasion Unit budget is \$375,000 per year and 50% of the budget is directed at dyed diesel fuel compliance, the cost of the dyed diesel education and enforcement program is \$187,500 per year. It is recommended that:

- AzDOT establish permanent internal funding for the dyed diesel education and enforcement program.

Despite the fact that the team’s enforcement efforts increase diesel tax revenues by more than \$1 million per year,

current efforts fail to capture another estimated \$500,000 in lost diesel tax revenue through continued violations. Currently, ADOT has only one fuel inspection team. Occasional staff unavailability due to court appearances, training, leave, or other activities sometimes prevents the team from operating on-road details for periods of time. At a minimum, the team should be staffed at a level allowing at least one on-road team to be conducting details throughout the year. This increased staffing level (i.e., two full-time enforcement officers and related costs) would cost approximately \$165,000 per year. Accordingly, it is recommended that:

- AzDOT expand the education and enforcement scope of work.

Dyed diesel education and enforcement efforts are hampered by the lack of complete and accurate blending, shipment, and sale data. Fuel suppliers are required to report the number of gallons of dyed diesel that are blended, shipped, and sold, but because there are no tax payments associated with these reports, there is little motivation to file timely, complete, and accurate reports. Currently, information technology vendors provide turnkey tax reporting and payment systems at no upfront cost to government agencies in exchange for a percentage of the tax revenue collected by the system. Thus, it is recommended that:

- AzDOT implement an automated system that allows fuel suppliers to track and report their blending, shipment, and sale of dyed diesel.

The opportunities to improve the effectiveness of dyed diesel education and enforcement efforts can be capitalized upon through a variety of strategies. The institutionalization of the education and enforcement program can be most directly accomplished through the establishment of permanent funding that is independent of grant funds provided by the Internal Revenue Service or other agencies. Based on the analyses reported here, this effort would yield a net return of more than \$650,000 per year. This is a benefit/cost ratio of 2.7. That is, for each dollar invested, \$2.70 is gained.

Concurrently, the dyed diesel education and enforcement team's scope of work and grant funding could be expanded to provide continuous enforcement efforts and to include efforts currently deployed by Internal Revenue Service. Current budget amounts and the results of these analyses suggest that this effort would produce a net benefit of \$272,240. This is a benefit/cost ratio of 2.6. That is, for each dollar invested, \$2.60 is gained.

Finally, an automated fuel supplier reporting system could be implemented to increase compliance with dyed diesel reporting and to provide the education and enforcement team with the basis for more sophisticated tactics. Although the exact return on this effort cannot be known until it is implemented, because there would be no upfront cost and the continuing cost would be a percentage of the tax collected, the net benefit must be positive. Conservatively then, the net benefit of the recommendations suggested here is almost \$1 million per year.

The full report *Dyed Diesel Education and Enforcement* by Robert S. Done, Ph.D., Data Methods Corporation, (Arizona Department of Transportation, report number FHWA-AZ-06-578, published July 2006) is available on the internet. Educational and governmental agencies may order print copies from the Arizona Transportation Research Center, 206 S. 17 Ave., mail drop 075R, Phoenix, AZ 85007; FAX 602-712-3400.